Minnegram Spring 2013

Director's Corner

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Features

- WRC awards research project grants

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- Phosphorus reduction in watersheds goal of workshops for farmers, ag professionals

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- Cutting down on salt: How KAP study expert Karlyn Eckman proved road salt training works

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  As part of the project, the MPCA turned to Water Resources Center senior researcher Karlyn Eckman, an expert the Knowledge, Attitude and Practices (KAP) study method, to evaluate the effectiveness of the training.

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ring 2013 Director's Corner

The energy was palpable in the room of 125 water specialists who had gathered at the Watershed Research Symposium on the St. Paul campus February 21 to discuss research needs and determine the water research agenda for the next five years in Minnesota. A panel of speakers had just talked about research needs from their perspectives, very different perspectives. Throughout the day, a number of attendees commented on how well the panel set the stage by addressing both urban and rural perspectives, while also presenting broad research as well as specific topics. I believe that the energy in the room came from new understanding of issues other sectors are facing as well as hearing their own issues presented. Participants also knew that the day was designed to gather information from them. It can be energizing to take a break from the day to day challenges to think more broadly and to hear about others' challenges.

Here at the Water Resources Center, we are privileged to see the diversity of issues and research on a daily basis. This issue of the Minnegram highlights just a few of areas of recent work here at the WRC. We look forward to the results of several small grants we have awarded to University researchers. You will see that this year there is a stronger emphasis on the human dimension and policy issues. Our own staff are working on very interesting and diverse projects, and we highlight several of those in this issue: the OSTP team will assess the onsite treatment systems at selected Minnesota Department of Transportation rest areas, we report on the effectiveness of road salt training for Dakota county snowplow drivers, and manure management workshops that combat excess phosphorus runoff.

Near the end of April or early May, you can expect to see the final research agenda from the Watershed Research Symposium. The issues are wide ranging, and will keep us all busy over the next five years

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The projects tackle water challenges in Minnesota and the Gulf of Mexico. Pinpointing the sources of excessive nitrogen in the Gulf and creating a framework for sustainable water management in Minnesota will be explored by the projects' Principle Investigators (PI's).

Building sustainable governance frameworks to sustainably manage Minnesota Water Resources

PI Sherry Enzler (FR, UM) and co-PI Mae Davenport (FR, UM) propose that sustainable water management will require managing water from a hydrological system perspective at the water basin scale, which is a core recommendation of the Minnesota Sustainability Framework. The Framework, presented by WRC co-director Deb Swackhamer to the Minnesota Legislature in 2011, advises revision of water law and policy to create a "regional water basin based governance structure to sustainably manage the state's water resources." The effectiveness of any resulting proposals to implement the SustainabilityFramework governance recommendations, however, would be enhanced by a deeper understanding of the interactions of current governance constructs, our water resources and water resource users and or stakeholders," according to the project abstract.

The Vermillion River Watershed will provide the model to help researchers understand the relationship between Minnesota's regulatory systems that affect water management players and the state's water resources in the Lower Mississippi River Basin. The outcome will be a system model that will direct governance decisions regarding hydrologic systems in the watershed, and water resources statewide.

Understanding Potential Landowner Perceptions and Adoption of Saturated Buffers

Nutrient-loaded water runoff draining into the Mississippi River from Minnesota farm fields contributes to the level of excessive reactive nitrogen in the Gulf of Mexico, potentially leading to contaminated drinking water, and ecological damage. Installation of drainage tile in rural Minnesota has increased farming productivity, and also allowed water runoff to bypass the natural subsurface buffers that would retain the water and allow the soil to process the nitrogen before it reaches the Mississippi. PI Dean Current (FR, UM) and co-PI Forestry Resources graduate student Charlene Brooks intend to survey farmers in the Elm Creek watershed about their attitudes regarding the environmental effectiveness and economic value of saturated riparian buffers and their willingness to install them. “It seemed logical to evaluate landowner perceptions of saturated buffers and identify potential constraints to adoption before campaigning to create additional buffers,” said Current. Overall, the goal of the study is to improve water quality through facilitating producer adoption of riparian buffers, and to make evaluations of technical and social factors contributing to or restraining adoption available to local governments and citizen groups interested in water

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ndra Postel encourages her audience to prepare for the new normal

Reprinted with permission from the Freshwater Society

About 300 people crowded into a University of Minnesota theater Tuesday, February 12, 2013, to hear a stimulating, informative – and, ultimately, inspiring — lecture by Sandra Postel, an author and advocate for protecting and conserving the world's water.

A panel of three Minnesota experts on water and climate joined Postel in taking questions from the audience. Panelists were: Paul Bolstad, a University of Minnesota forestry professor who was one of the contributors to a recent National Climate Assessment; Kate Brauman, a research scholar in the university's Institute on the Environment; and Deborah Swackhamer, a professor of science, technology and public policy and co-director of the university's Water Resources Center.

The Freshwater Society interviewed Postel about her work, her goals for the lecture and her hopes for the future. The following is a transcript of the interview, edited for clarity and brevity:

What's your story? Where did you grow up? What was your education? How did you get interested in water?
I grew up on Long Island in New York. I was a beach kid, growing up near the ocean. In school, I studied geology and political science and resource management and ecology. I got very interested in ecosystems, wetlands and freshwater, particularly in graduate school. Then, my first job out of graduate school was with a natural resources consulting firm, and I was pretty much put on the freshwater detail. Three years after that, a major opportunity opened up to take on the global water portfolio at the World Watch Institute in Washington, where I spent the next 11 years and really developed my understanding, developed a research capacity, in fresh water.

You've written or co-written three books on water. Give us just a one- or two-sentence summary of each of those

books, please.

The first book, Last Oasis: Facing Water Scarcity, was one of the early books to sound a warning about the global implications of water scarcity. I had a lot of pride in that book because I think that it put water scarcity a little bit on the map in a global sense. That book is now translated into maybe eight or nine different languages and it's been made into a PBS documentary, so it has reached the public.

The next book, Pillar of Sand: Can the Irrigation Miracle Last?, is a look at the history and sustainability of irrigated agriculture, pointing out that, historically, irrigation civilizations have failed. It was asking the question: Will ours be any different? It pointed to groundwater over-pumping, salinization of soils, extinction of rivers — those kinds of threats — as well as pointing toward solutions.

The third water book was, Rivers for Life: Managing Water for People and Nature, which was a bit more technical, but still highly readable. It focused on river management, how we can operate our dams and manage rivers with ecosystem health in mind. It examined how we can put ecosystem health into the equation of how we manage rivers and pointed out successes where that has been done and the kind of policies we need.

You founded the Global Water Policy Project. What is that and what does it do?

I founded the Global Water Policy Project in 1994 when I left the World Watch Institute. The Global Water Policy Project promotes the preservation and sustainable use of the Earth's fresh water. That's done through research, writings, outreach and public speaking. The idea is to foster ideas, innovation, inspiration for redirecting how we use and manage fresh water toward conservation and preservation of ecosystem health.

Tell us about your involvement with the National Geographic Society.

National Geographic appointed me to be their Freshwater Fellow in 2010. I head up their Freshwater Initiative. The goals of the Initiative are to educate and engage the public on issues related to fresh water, helping people understand water scarcity, helping people understand their own water footprint and what they can do in their own lives and through their own actions to be part of the solution, understanding how they can conserve water. On the ground, we're working to restore flows to critical ecosystems in the Colorado River Basin. It's quite an innovative effort to get real gallons of water back to ecosystems throughout the basin. That campaign will be launched in a more formal way in early 2013. But we've already done one project, and a very successful one.

The title of your lecture here is, "Will We have Enough Water: Adapting to a Warming, Water-Stressed World." In a few words, what's going to be your core message for the audience here?

The core message of my talk will be that we've entered a new phase in our relationship with water that leads to water scarcity. In part, it is due to population growth and rising consumption, and now, increasingly, due to climate change.

We're going to need a different set of actions, policies, tools, from individuals, to communities, to state governments, to national governments and internationally, to address these challenges in a meaningful way. That will be the basic core of my talk: What the issues are, what the challenges are, and how we can begin to address them. We are facing 8 billion people by 2025, 9 billion by 2050. How are we going to meet the water, food, and energy needs of a population that large if we don't have healthy ecosystems to support our economies and the rest of life on the planet?

In 2010, you wrote an article for the Post-Carbon Institute and you offered a percentage for the increase in water productivity the world needs to achieve by 2025 to be sustainable. What was that percentage, and what do you mean by "water productivity"?

Water productivity is the value or benefit we're getting from every gallon of water we extract from the natural environment. If we're going to have any chance of meeting the needs for water, energy, food, for 9 billion people, we're going to have to dramatically increase water productivity. My sense is that we're going to need at least a doubling of water productivity by 2025, and that beyond that, tripling, quadrupling. Those are obviously very rough numbers –who knows what we're going to need — but we're going to need a really dramatic increase in the value per unit of water we extract from the natural world.

We're running out of water in so many places. Groundwater is over-tapped, rivers are running dry. So the supplies are just not there for tapping in the way we have in the past. We need to make sure each gallon is giving us more nutritional productivity and more economic productivity. Unleashing technology, policy and innovation is necessary to help us do that.

How do you see climate change — global warming — affecting water supplies around the world?

When we think about climatic change, most of the ways we'll experience it are in some fashion through the global water cycle.

Of course, temperatures are going to be increasing just about everywhere, so we'll have that temperature rise. But beyond that, in terms of how we'll experience climate change, there will be more intense floods, more intense and prolonged drought. Those kinds of ramifications — changes in river flows, changes in glacial melt — all impact the water cycle.

Just looking at the last couple of years, we had tremendous flooding in 2011 in the Mississippi River Basin that required the levees to be breached in order to prevent flooding in Cairo, Illinois. And this year, there is serious concern about shipping being impacted by low flow.

Preparing for this new normal is going to be increasingly critical. Of course, there's the flooding and so on that came recently with Hurricane Sandy and, in my part of the world, dealing with the serious drought that is expected, long-term. Dealing with this is going to take some major investment in how we think about water use and adapting to this new normal.

Lots of scientists, and I'm thinking here specifically of Jonathan Foley of the University of Minnesota, have written that the world faces a dramatic challenge, that of figuring out how to feed and provide clean water for an additional 2 billion to 3 billion people, while at the same time easing the over-use and abuse of water that already exist. Do you see a way to do that?

This is exactly the question I've been writing about for 30 years The only way we're going to do that is to dramatically increase water productivity and make sure that we put ecosystems back into the equation. We've been managing water as if it's a limitless supply, as though there's no end to the supply in sight. In fact, we do now have aquifers getting depleted, we do have rivers running dry. And yet, the demand is increasing. So it's only by beginning to focus our policies toward protecting ecosystem health that we're going to have any chance to have healthy rivers, beginning to cap groundwater pumping so that we don't deplete groundwater supplies. If we do these things and start soon, we can, in fact, meet these growing needs and still have reasonably healthy ecosystems.

Are there particular steps we need to take to protect those natural ecosystems?
Absolutely, there are. If we think about groundwater, for example, there needs to be a cap on groundwater pumping that keeps the pumping within a sustainable limit. For example, we have the Ogallala Aquifer in the United States that's undergoing depletion. We have very important aquifers in the Central Valley of California, where our fruits and vegetables are grown, that are still undergoing depletion in this country.

And that's worldwide — in India, China, in Iran and Mexico. Very few places have a cap on groundwater pumping in place. The ones that do have shown that you do drive up water productivity. You give users of that groundwater, whether it's farmers or cities, the message that they're going to have to become more efficient. It works, but it's being tried in too few places.

When you do talk about a cap on groundwater pumping, are you suggesting there should be no diminution of aquifers or that there should be some sort of numerical limit set on how much lower we would allow aquifers to drop?
It really depends on the situation. One example is the Edwards Aquifer in Texas. In this case, the aquifer sustained some springs that were a habitat for seven endangered species. A cap was put in place to make sure that pumping did not make the aquifer decline to a level that would threaten the species. If you look at water use in that part of Central Texas now, you'll find that irrigation has become more efficient, the City of San Antonio instituted very significant and very successful water conservation programs, and the public is well aware of the aquifer that is the source of their water and why, if it's a dry summer, they have to have sprinkling bans.

Everyone is engaged in the effort. And this is a good example, I think, of what a cap can do, and the kinds of conservation and efficiency measures it fosters. They're sustaining threatened species, even as you still have productive agriculture and thriving cities.

If you were the Water Czar or Water God and you could decree one major policy change governing water use around the world, what would it be?
It would be along the lines we were just talking about. It would be a cap on our water use to sustain ecosystems, including groundwater aquifers. If we could get that in place, innovations will follow.

In your personal life and lifestyle, what do you do to "walk the talk" of protecting water resources for future generations?
I try to use water as efficiently as possible in and around the home, I also have a water-conscious diet. It turns out that our diet, particularly as Americans, is far and away the biggest component of our water footprint.

Only about 5 to 10 percent of our total water consumption, the water that sustains our lifestyles, is actually flowing out of our faucets at home. About half of it is in our diet, about a third of it is in our energy use, and the rest is in our miscellaneous consumption of goods and services, our clothes and computers and that kind of thing.

We have installed solar panels at our home here in New Mexico. So we're trying to be helpful in reducing the water footprint

of the energy component. We have a vegetable garden that's watered by an efficient mechanism. We have efficient fixtures. We're thinking about putting in a sustained water harvesting system — that's the next sort of big project on our list — to capture the monsoonal rains here in the summer so we can use that rain more effectively for irrigating the vegetable garden and so on.

And then I do watch diet issues. I do occasionally eat meat, but Americans eat a lot of meat, particularly red meat, which is one of the most water-intensive foods in our diet. When I do enjoy a hamburger, I make sure it's grass-fed and not grain-fed because the water implications are very different for grass-fed hamburger vs. a grain-fed burger. The average grain-fed burger takes something like 650 gallons of water just to make one burger, and it's a tiny fraction of that for a grass-fed burger.

Also, I'm not a big consumer of material things. Manufacturing a cotton T-shirt takes about 700 gallons of water, so one can use fewer cotton T-shirts and save water.

In the final analysis, are you optimistic or pessimistic about prospects for humankind and the environment we depend on?

I maintain a realistic optimism. I do believe that we have the capacity for fundamental change and so I do maintain an optimism that, as we understand these changes that are coming, we can adapt. We have a long way to go, but I do remain optimistic that we can meet these challenges.

View Postel's lecture here>>

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site Sewage Treatment Program awarded grant to study MNDot rest areas

By Sara Heger

There is little information available on the 51 septic systems serving the rest stops and truck garages across Minnesota at MnDOT facilities. Many of these systems are more than 30 years old, and the lack of information makes managing these systems, prioritizing replacement and designing replacement systems very difficult. It is generally understood that these systems are subject to challenging site conditions and wastewater characteristics. The University of Minnesota's Onsite Sewage Treatment Program will collect data - to assure the systems are adequately treating wastewater and will continue to do so over the long term.

The project will first develop a protocol for system assessment and then implement the assessment on five sites. The assessment will include evaluating the current system components, identify any deficiencies and provide recommendations for improvements, if needed. Initial grab sampling of wastewater characteristics including flow and effluent quality will be obtained, if accessible, and a sampling protocol developed for the system operator. The first five sites to be evaluated will help develop a risk-based assessment model focusing on site and wastewater characteristics specifically for the MnDOT sites. The remaining 46 sites will be evaluated based on the procedures developed and prioritized based on the risk-based assessment model.

Long-term research includes selecting several of these sites to conduct more in-depth studies on wastewater characterization, flow characteristics, contaminant fate and transport through these systems and soils and groundwater mounding monitoring and analysis. This research will not only better inform MnDOT on operation and maintenance activities, but provide knowledge for design of new and replacement systems. The type of data collected will not only benefit Minnesota's surface and groundwaters, but provide insight for various other states currently struggling with rest stop design

and maintenance. The Minnesota onsite industry will also benefit from the long-term data collected on these sites that will be used to modify the current MPCA Design Guidance for systems and be included in Intermediate and Advanced Design training for systems with pre-treatment and larger design flows. It is anticipated that this more in-depth research will require data collection efforts over a three to five year period. Two sites have been selected to start this more in-depth research by both evaluating impacts from their old system and installer piezometers and monitoring wells on their new systems to be installed in 2013.

This project will first and foremost evaluate the current condition of the 51 systems in relation to protection of public health and the environment. With the initial and subsequent sampling a database will be developed to aid in future system design and management.

"The data collected in this project will result in better information about how to design and manage septic systems at rest stops in Minnesota and across the US," said Dave Gustafson of the Onsite Sewage Treatment Program.

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osphorus reduction in watersheds goal of workshops for farmers, ag professionals

Minnesota's dairy belt stretches through the central and southeastern part of the state, loosely paralleling the rolling lands of the upper Mississippi River. Farmers in this region have increasingly looked to livestock manure—from dairy cows, as well as beef, poultry and swine—as a valuable local resource and an economically smart alternative to commercial fertilizers.

But like many fertilizers, manure contains phosphorus that can leave a field with surface runoff water. Excess phosphorus entering a water system causes intense algae blooms. The bacteria involved in algal decomposition can starve a water system of dissolved oxygen, killing off native fish and aquatic organisms and speeding up a lake's eutrophication.

University of Minnesota Extension educator Randy Pepin, a former livestock industry consultant, hopes to make grid soil sampling a common practice among farmers who choose to use livestock manure. Grid soil sampling can be a cost effective way for farmers to target their nutrient application while reducing the amount of phosphorus entering the watershed.

Pepin's statewide "Will Grid Soil Sampling Work for my Livestock Farm?" workshops use case studies developed by the Water Resource Center and University of Minnesota Extension to demonstrate the economic and environmental benefits of grid soil sampling in manure applications.

In grid sampling, fields are divided into to two and one-half acre grids, then tested for nutrients such as phosphorus and potassium. The data is used to create custom maps for farmers to guide their manure applications.

The customized maps are key: a farm's nutrient level can vary widely based on topography, soil type, crop cover and history of manure application. Concentrating nutrient application where it's needed increases the fertilizer substitution value of the manure and reduces the risk of phosphorus runoff into lakes, streams and the surrounding watershed. Grid soil mapping also complements other conservation practices like minimum tillage, contour tillage, strip tillage, crop rotation and buffer strips.

The McKnight Foundation-funded workshops have attracted a range of participants including regional dairy, beef, poultry and swine farmers and crop consultants, and staff of Soil and Water Conservation Districts and Natural Resources Conservation Service. “We can multiply our efforts by educating the educators,” says Pepin.

As expected, workshop participants range in their motivations. “Sometime participants just want a better understanding of phosphorus in relationship to the environment, while others are looking for a thorough understanding of the grid sampling and how to use it,” says Pepin.

Regardless of intent, all workshop participants walk away knowing how grid-sampled maps illustrate their field’s phosphorus and potassium content and how the grid soil sampling technique helps them target nutrients to where they’re needed the most.

But while Pepin’s focus is on agricultural production, dozens of human activities contribute to the problem of excess phosphorus entering our water systems.

“Industrial waste, municipal waste, impaired sewer systems, residential lawn runoff, and erosion from agriculture land and feedlots all contribute to excess phosphorus,” says Pepin. “Realistically, attaining significant reduction of eutrophication of our waters requires action from all sectors.”

Extension educator Randy Pepin hopes that the workshops will educate the educators, widening the reach of the grid soil sampling technique.

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tting down on salt: How KAP study expert Karlyn Eckman proved road salt training works

When used as road salt, sodium chloride can be a significant threat to the integrity of freshwater ecosystems. Nearly 70 percent of Minnesota's road salt ends up in nearby lakes, wetlands and streams where as little as one teaspoon per five gallons of water can be devastating to aquatic life. In addition to their environmental hazards, de-icing chemicals like road salt are costly for municipalities to purchase, store and apply.

But road safety in winter is also important. And Minnesota commuters increasingly depend on the ability to travel around the clock, throughout the year, storm or no storm.

In 2008, the Minnesota Pollution Control Agency (MPCA) piloted a 14-month training program for Dakota County snowplow drivers aimed at improving operator effectiveness and reducing the amount of sodium chloride entering nearby lakes and streams. The training program was developed by Connie Fortin of Hamel-based Fortin Consulting, an environmental consulting firm that specializes in water quality projects.

As part of the project, the MPCA turned to Water Resources Center senior researcher Karlyn Eckman, an expert the Knowledge, Attitude and Practices (KAP) study method, to evaluate the effectiveness of the training.

KAP is an evaluation tool borrowed from the field of public health that zeros in on a subject's knowledge, attitudes and practices surrounding a specific issue or problem. Eckman has successfully applied the KAP method to water-related natural resource studies ranging from non-point source pollution to urban storm water management and invasive species control.

"Water resources professionals are trained in hydrology and other biophysical sciences and are not typically exposed to social science research or evaluation tools," says Eckman. "Yet most water quality issues involve people, who may be either contributing to the problem or be impacted by it." Eckman says KAP studies can help identify the causal links between

human behavior and biophysical impacts.

By administering the KAP study prior to the Dakota County training in 2008 and after the 2008 and 2009 winter maintenance seasons, Eckman was able to document measureable improvements in driver knowledge, attitudes and practices related to specific application activities. The positive changes reported in driver questionnaires and interviews were reinforced by numbers—Dakota Country went through a lot less salt per snow event.

Eckman's KAP soundly demonstrated that Fortin's winter maintenance training was effective in changing the actions of snowplow drivers. It also helped Dakota County officials identify where further improvements in training could be made.

As a result, more MPCA snowplow training sessions have been added for municipalities around the state. And Eckman's road salt study was showcased this year at the Freshwater Society's Annual Road Salt Symposium.

"KAP is a cost-effective, practical evaluation method that can be learned with training and mentoring, says Eckman, whose training package on social assessment and evaluation of natural resource project will be available on the MPCA's website later this year.

No salt needed: KAP researcher Karlyn Eckman and her dog Packer on a winter commute.

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Water Resources Center

ring 2013 Student News

Brittany Kruger was named a winner of the Elsevier Research Scholarship. The scholarship was launched in 2012 and is intended to encourage exchange of ideas, expertise and techniques and cultivate the scientific dialogue which Elsevier, Organic Geochemistry and European Association of Organic Geochemistry (EAOG) believe to be fundamental to the advancement of research. The winners will each receive a prize of €2,500 to assist with their research projects. Kruger is advised by **Josef Werne** and **Elizabeth Minor**.

Thomas Pevan received his M. S. Degree in December 2012. His thesis was titled: Factors Contributing to Cyanobacteria Blooms in Upper Saint Croix Lake, WI. Pevan was advised by **Stephanie Guildford**.

Emily Resseger received her M. S. Degree in February 2013. Her thesis was titled Communication and Public Outreach for Emerging Contaminants in Public Drinking Water Supplies in Minnesota. Resseger was advised by **Heinz Stefan**.

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ring 2013 Publications and Resources

State of the River Report

The State of the River Report highlights the history, status, and trends of 13 key indicators of water quality and river health in the Twin Cities metro Mississippi River. Developed over 15 months in partnership with a team of more than 30 scientific advisors, the report distills a wealth of river data down into simple terms that non-scientists can understand. By presenting clear and concise information on important factors of water quality and river health, the State of the River Report offers readers the opportunity to learn more about this resource and contribute to its protection and restoration. *State of the River*.

Journal of Industrial Ecology Special Issue: Sustainable Urban Systems

Volume 16, Issue 6, December 2012

Larry Baker, guest co-editor

This special issue demonstrates how practical solutions to the development of sustainable cities can be achieved through studying urban metabolism, urban ecology, city carbon and water footprints, the dynamics of city growth, and the interdependency between social actors, institutions, and biophysical system flows.

http://onlinelibrary.wiley.com/doi/10.1111/jiec.2012.16.issue-6/issuetoc

Food Security and Vulnerability in the Lower Mekong River Basin

Eckman, Karlyn and Lilao Bouapao. 2012.

AWRA's Impact Volume 14 No. 6, November

The Mekong is one of the world's great rivers (listed as tenth longest in the world) and provides water necessary for sanitation and raising food for tens of millions of people. Fed by glacial meltfrom the Tibetian Plateau, the Mekong is vulnerable to flood, drought, and pollution. Thus the food supply for the region is vulnerable as well. The authors explore these vulnerabilities for the near and longer term.

Using Social Science Data to Evaluate Residential Stormwater Treatments in Duluth, Minnesota

Eckman, K., V. Were, V. Brady, J. Schomberg, R. Axler and C. Kleist. American Water Resources Association IMPACT

Volume 15 No 2, March 2013.

Improving Evaluation of International Water Projects Were, V. and K. Eckman

American Water Resources Association IMPACT

Volume 15 No 2, March 2013.

Whole-Watershed Phosphorus Balance as Practical Tool to Achieve TMDL Goals

Peterson, H. L. Baker, J. Ulrich and J. Nieber.

Minnesota Water Resources Conference, Oct. 16-17, 2012.

The goal of this project is to develop tools to support implementation of TMDL plans. The authors examine two tools: watershed P balances, and a hydrologic tool to assess flowpaths of nutrients.

Quantifying Nutrient Load Reductions Through Targeted, Intensive Street Sweeping – A Field Study by the University of Minnesota in Partnership with the City of Prior Lake

Kalinoski, K., L. Baker and S. Hobbie.

Minnesota Water Resources Conference, October 16-17, 2012.

Urban runoff is a major contributor of nutrients (nitrogen and phosphorus) to urban lakes. High nutrient input causes lake eutrophication, characterized by high algae densities and low water clarity. Lowering nutrient inputs reverses eutrophication, resulting in lower algae densities and improved clarity. Cities struggle to find cost-effective ways to reduce nutrient export from their streets. Some control measures are very expensive: trapping phosphorus in stormwater ponds costs up to $500-1000 per kilogram using stormwater ponds and $1000-4000/lb using raingardens. In this study, the authors quantify the nutrient load reduction that can be accomplished by street sweeping. They hypothesize that street sweeping can be a highly cost-effective method for removing nutrients from streets, and hence from being washed into lakes, at least under some circumstances.

Importance of Hydrologic Pathways to Urban Nutrient Loading and Implications for Current Stormwater Management Practices

Janke, B. J. Finlay, S. Hobbie and L. Baker.

Minnesota Water Resources Conference, October 16-17, 2012.

Transport and Fate of Chemicals in the Environment: Selected Entries from the Encyclopedia of Sustainability Science and Technology

John Gulliver, editor. Springer, 2012.

What happens when a chemical is released into the environment? It diffuses, disperses, adsorbs, reacts, and/or changes state. To predict and analyze this process, the mathematics of diffusion is applied to lakes, rivers, groundwater, the atmosphere, the oceans, and transport between these media. A sustainable world requires a deep understanding of the transport of chemicals through the environment and how to address and harness this process. This volume presents a

succinct and in-depth introduction to this critical topic. Featuring authoritative, peer-reviewed articles from the Encyclopedia of Sustainability Science and Technology, Transport and Fate of Chemicals in the Environment represents an essential one-stop reference for an audience of researchers, undergraduate and graduate students, and industry professionals.

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ring 2013 Upcoming Events

April 24, 2013

MGWA Spring Conference 2013

Hydeogeology and Public Health

Connecting Science, Education and Policy

For more information, visit: http://www.mgwa.org/

September 12-13, 2013

Clean Water Summit

Minnesota Arboretum

Chanhassen, MN

October 15 and 16, 2013

Water Resources Conference

St. Paul RiverCentre

St. Paul, MN

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Minnesota Extension.

ring 2013 Legislative Update

By Deb Swackhamer

'Tis the season of hurry-up-and-wait. We have been allocated half of our fiscal year 2013 funds, but the other half are on hold pending a budget agreement or continuing resolution for the remainder of the year. And yes, the remainder will likely be affected by the "sequester", and in ways we do not yet know. We have not seen the fiscal year 2014 budget…

At the state level, we have just passed the deadline for passing bills out of their originating committee – now the scramble is on for deal making and amendments, and passing them through the committee daisy chain to the floors of the House and Senate. Current bills related to water resources include the Clean Water Fund appropriations bill, a bill on TMDL accountability, a bill banning triclosan in products in Minnesota (a water pollutant), and the agriculture bill which also includes provisions and funds for the Agriculture Water Quality Certification program.

Bottom line, stay tuned until June!

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ring 2013 Community News

Minnesota Water Resources Conference Call for Abstracts

Deadline: Friday, May 10, 2013

View PDF copy of the Call for Abstract>>

The Minnesota Water Resources Conference presents innovative, practical, and applied water resource engineering solutions, management techniques, and current research about Minnesota's water resources

Abstracts are due by Friday, May 10, 2013, and must be submitted electronically to: www.wrc.umn.edu/waterconf. Clearly describe the work in 100-150 words, include a descriptive title, and list all authors and their affiliations. Abstracts received by May 10 will be reviewed and the submitter will be notified in June if the abstract is accepted.

Larry Baker (WRS faculty, BBE) presented a talk "Can biogeochemists help to enhance urban resilience?" at the 2012 American Geophysical Union Conference, in Symposium on Urban Biogeochemistry, and then attended a NSF workshop, "Greening of Cities International Research Workshop" in Auckland, New Zealand, December 10–13, 2012. Baker also attended a Fluxes and Flows workshop March 14–15 in Phoenix, Arizona, part of a NSF project "Urban Sustainability Research Coordination Network "

Dr. Paul Bourget recently joined the WRC as a research associate. He grew up in Hudson, Wisconsin and spent the bulk of his career in the Washington, D.C. area where he worked for the federal government and served as an adjunct professor at the George Washington University. He finished his federal career at the Corps of Engineers' Institute for Water Resources (IWR) where he was responsible for managing projects related to international engagement strategies, advanced degree planning and integrated water

resources management. He earned his Master's degree in applied geography from George Mason University and his Doctor of Science degree in engineering management from the George Washington University. Bourget held several positions throughout his career with the federal government, including assignments to the Office of the Secretary of Defense, the National Reconnaissance Office, the Engineering Research and Development Center and the National Geospatial Intelligence Agency. Upon retirement, he returned to the Twin Cities area where in addition to working for WRC he volunteers in areas such as mediation, community service and river conservation. He resides in Hudson with his wife Lisa and their children Marie and Gerry, as well as two dogs and a cat. His work at WRC will focus largely on water resources course planning.

The **Watershed Research Symposium** was held February 21 at the Continuing Education Conference Center on the St. Paul Campus. The symposium was attended by 125 invited water experts, who worked to identify water research needs for Minnesota for the next five years. A follow-up survey was conducted, and the final report will be posted on the Water Resources Center website in late April or early May.

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